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Dry Caustic Peeling of Clingstone Peaches. Capsule Report

Environmental Protection Agency, Cincinnati, Ohio

Jul 73

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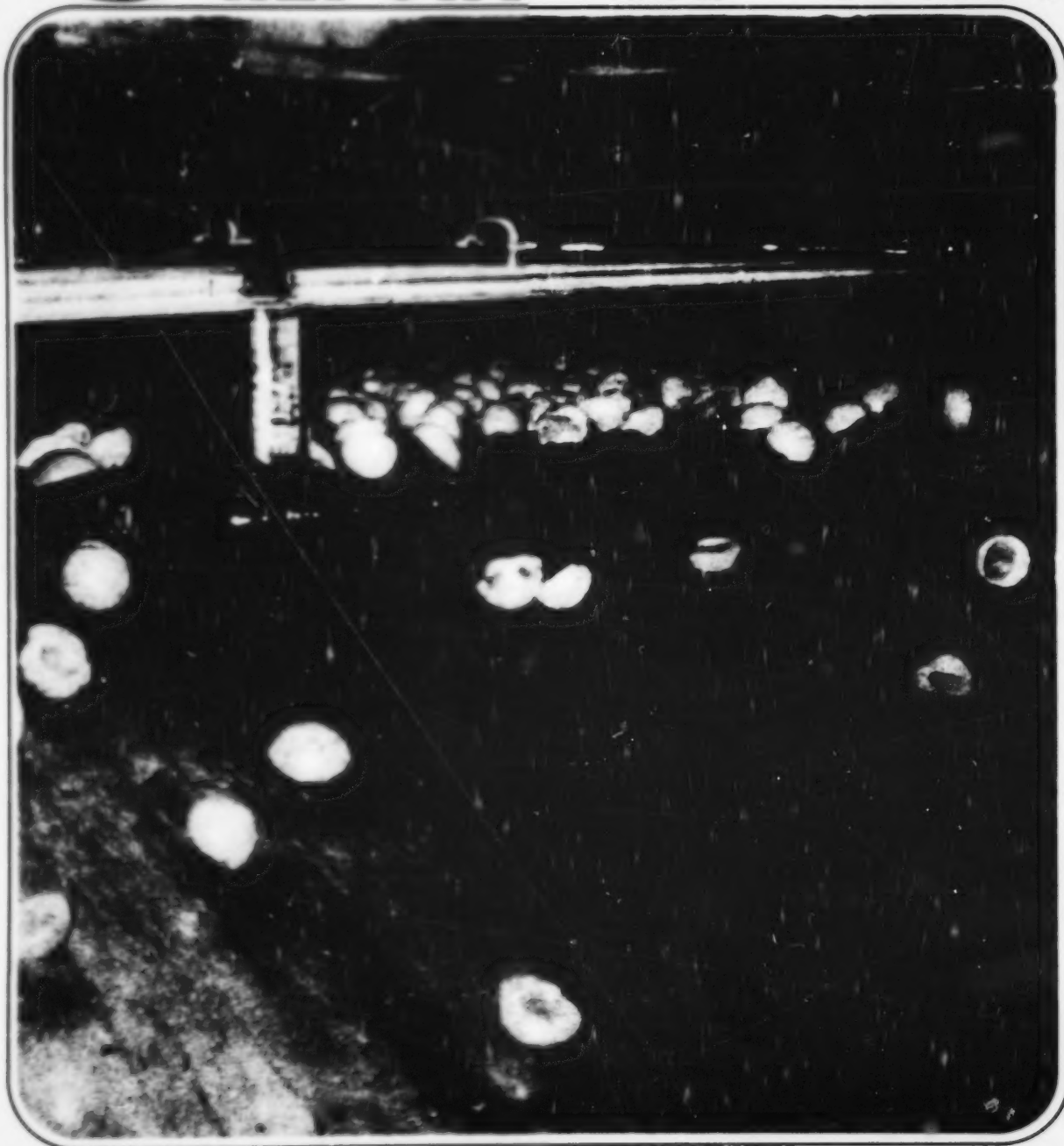
EPA
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CAPSULE REPORT

DRY
CAUSTIC
PEELING
OF
CLINGSTONE
PEACHES

PB 258 809

U.S.
ENVIRONMENTAL
PROTECTION
AGENCY
INDUSTRIAL
DEMONSTRATION
GRANT WITH
DEL MONTE CORPORATION



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16. ABSTRACT

This Capsule Report discusses the modified dry caustic process which uses rapidly rotating rubber discs to mechanically wipe the caustic treated peel from clingstone peaches. This report covers two-seasons of evaluation during which the dry caustic peeling system was operated in parallel with a conventional peeling system.

PRICES SUBJECT TO CHANGE

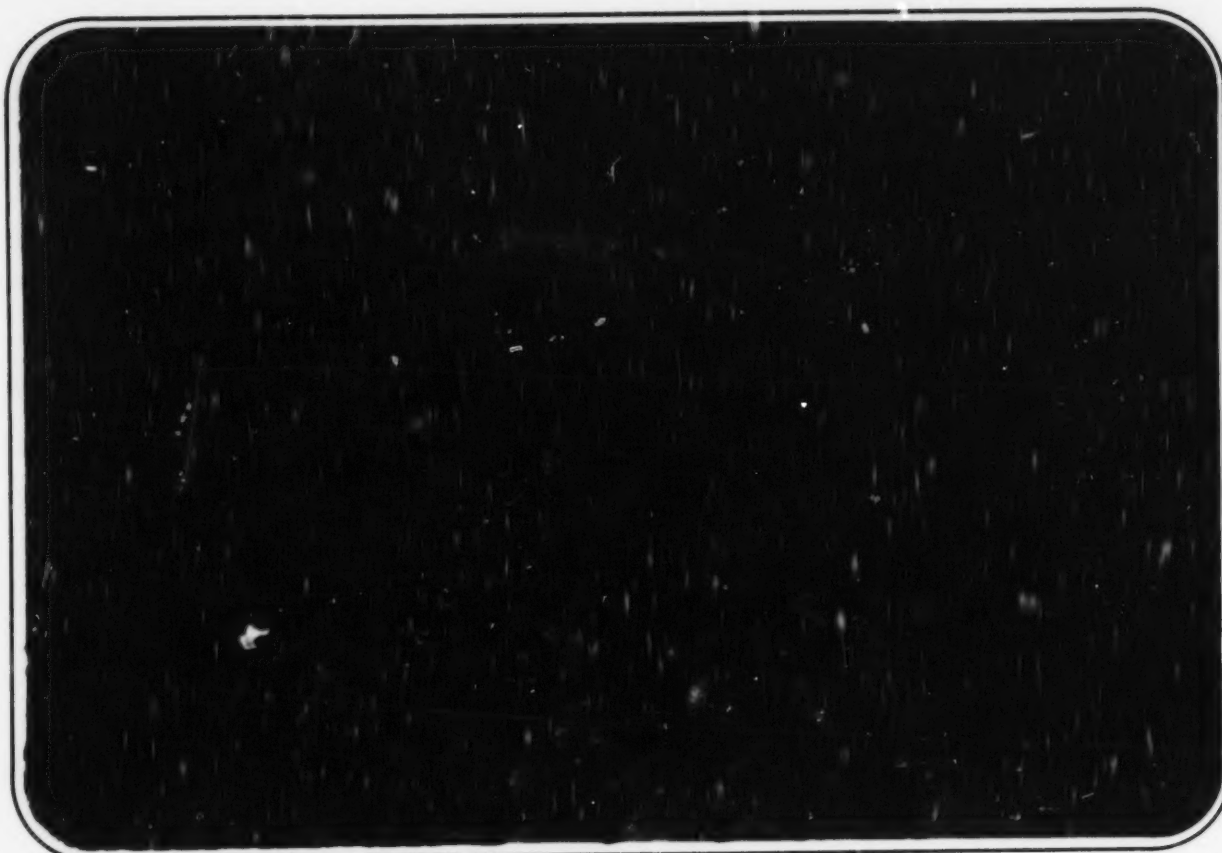
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Entering the Caustic Spray Unit

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THE SIGNIFICANCE

The annual production of canned clingstone peaches in the United States exceeds 30 million cases. These peaches are canned during a season ranging from a few weeks to a maximum of three months. Since the wastes from canning operations are produced over such short time periods, they present problems in economic design utilization and operation of treatment plants.

Peeling is the largest single source of waste from fruit processing, accounting for as much as 10 percent of the total wastewater flow and 40 percent of the total biochemical oxygen demand. In conventional peeling, the peel is pre-softened by contact with dilute sodium hydroxide and then removed from the peach by high pressure sprays using large amounts of fresh, potable water.

Water from the peeling operation therefore contains essentially all of the removed peel.

Dry caustic peeling in which mechanical rubbing is used to remove the softened peel was originally developed for the potato processing industry; however softer fruit such as peaches required the development of a new process.

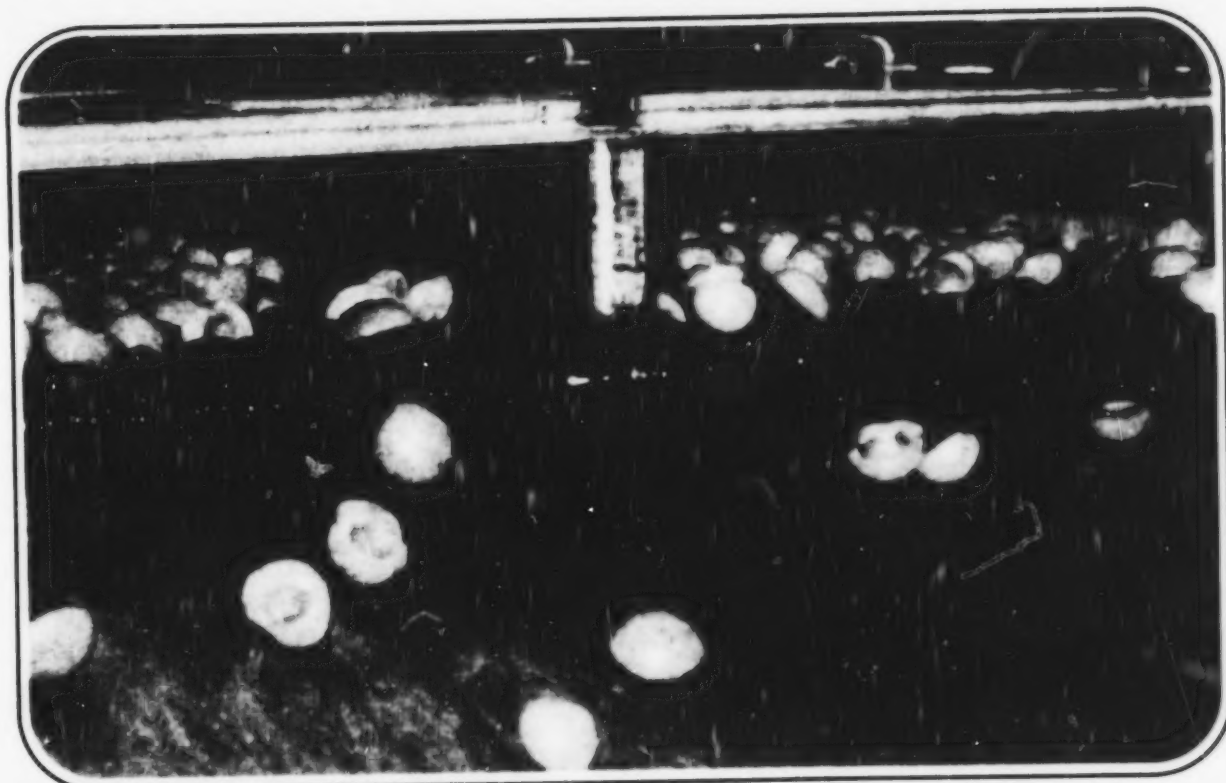
The modified dry caustic process discussed in this report uses rapidly rotating rubber discs to mechanically wipe the caustic treated peel from clingstone peaches. A final rinse to remove the last traces of peel and caustic is the only fresh water use. During this EPA demonstration grant with the Del Monte Corporation water usage in the peeling operation was reduced from 850 gallons of water per ton of peaches to 90 gallons per ton by dry peeling.

The dry caustic peeling process also allows for collection of the peel as a pumpable slurry. This slurry may have potential value as an animal supplement or in reclaiming marginal farm land. Because the peel is not carried in the wastewater flow, the total organic and suspended solids loading of the wastewater from the peeling process is reduced by about 60 percent. Peach quality was judged to be equal to that of conventionally peeled peaches.

This report covers two seasons of evaluation during which the dry caustic peeling system was operated in parallel with a conventional peeling system at the Del Monte, San Jose, California Plant #3.

2.

THE NEW PROCESS



Leaving the Dry Peeler

The dry caustic peeler (Figure 1) incorporates a dilute sodium hydroxide application system identical to conventional equipment. Pitted peaches are placed on a wire mesh conveyor with the pit cavity down ("cup-down"). The skins are subjected to a hot sodium hydroxide spray for approximately 10

seconds. The chemical action is completed in a steam heated holding section.

The test unit, rated at 20 tons per hour, has a series of 39 stainless steel shafts on which rubber discs are positioned. Discs are of two types (Figures 2, 3). The larger 4-1/4 inch diameter "Flange Disc" (Figure 2) has a

flexible flanged edge to remove the softened peel as peaches travel "cup-up" along the tops of the discs. The smaller "stub discs" (Figure 3) are 2-3/4 inches in diameter and are positioned to invert any peach halves which have turned into a "cup-down" position as a result of the tumbling action.

Discs rotate at a speed of approximately 325 RPM. The rotating action also transports the fruit.

The length of peeling time is controlled by adjustment of the upward slope of the rotating disc unit and the length of the peeling unit section. A tank beneath the discs collects the peel and caustic residue as a slurry, which is pumped to a solid waste hopper.

Following the disc unit, peeled peaches are dropped into a rinse tank and removed from the tank by a flight conveyor. In the demonstration unit, three manifolds of fresh water sprays mounted above the elevator conveyor remove residual peel and caustic residue, and provide make up water for the rinse tank. Each manifold has four spray nozzles, delivering approximately one gallon of fresh water per minute per nozzle. Water level in the rinse tank is controlled by an automatic sensing device. A bleed stream from the rinse tank, equivalent in volume to the nozzle flow, is the only effluent from the unit. Rinsed fruit is conveyed to an inspection station and then to the next stage in canning.

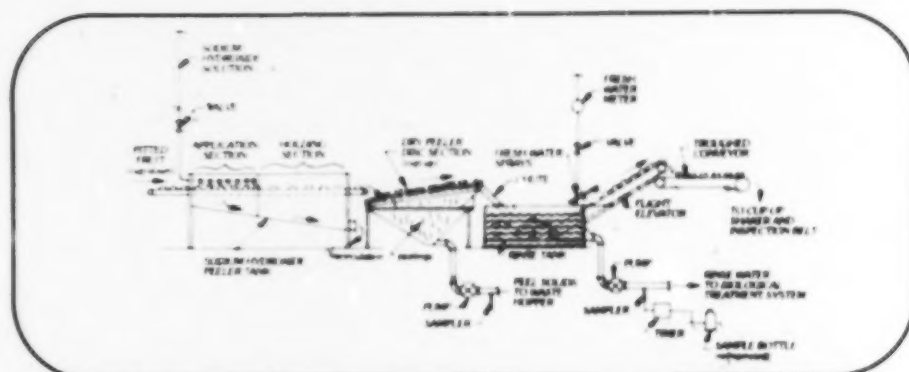


Figure 1. Schematic dry caustic peeler

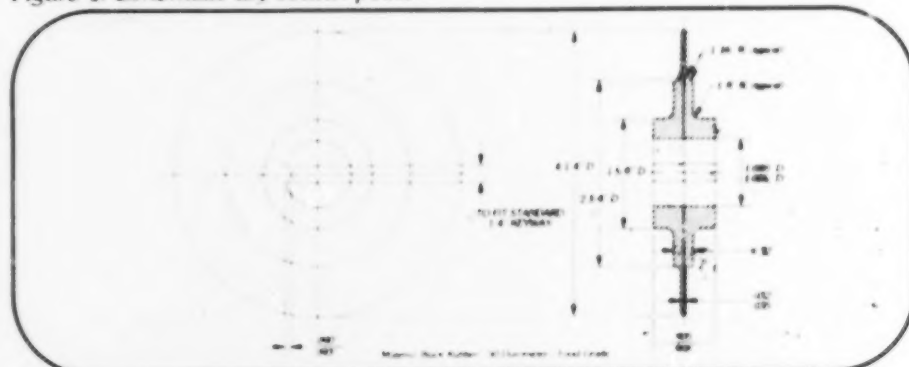


Figure 2. Flange Disc Detail

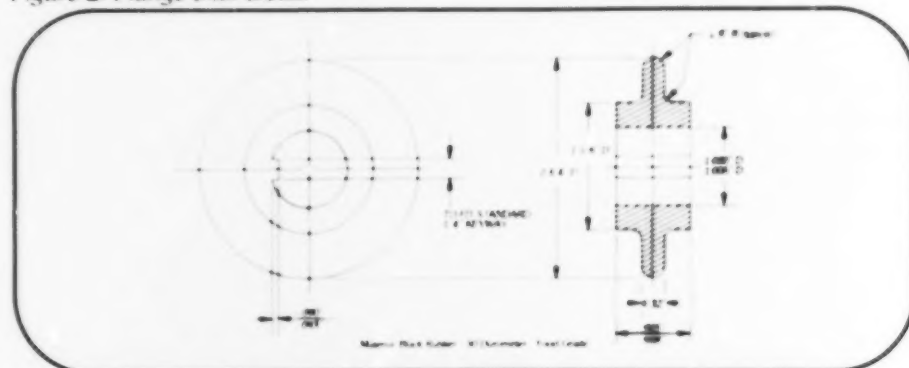
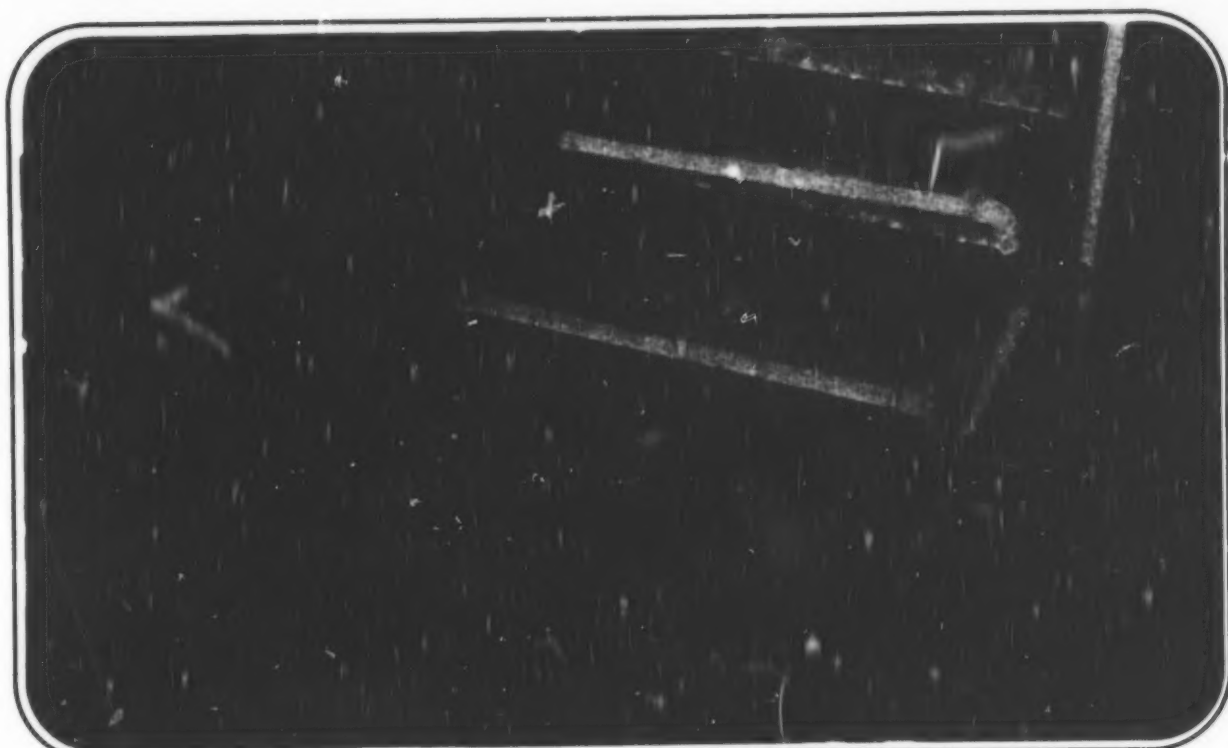


Figure 3. Stub Disc Detail

3.

**THE
OLD
EFFLUENT**

**VS.
THE
NEW**



The Fresh Water Rinse

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The most striking result of the commercial tests of the dry caustic peeler is the 90 percent reduction in water use as compared to the conventional caustic peeler. Significant pollution parameters can be reduced by approximately 60 percent. Table I illustrates the average wastewater volumes and pollution loadings for each process, based on 24-hour composite samples taken on each of the 21 days of the demonstration period.

Table II summarizes the characteristics of the peach peel solid wastes. The relatively high pH of the slurry and the low pH of the rinse water indicate that most of the caustic is removed with the peel.

TABLE I

Comparison of the Average Liquid Effluent from the Del Monte Dry Caustic Demonstration Project with Conventional Caustic Peeling

All units in lbs/ton of peaches unless otherwise noted.

	Conventional Caustic Peeling	Dry Caustic Peeling
Water usage	850 gals/ton ¹	90 gals/ton
COD	10.8 (1,500 ppm)	4.2 (5600 ppm)
BOD ₅	6.7 (940 ppm)	2.8 (3700 ppm)
Suspended Solids	5.6 (790 ppm)	1.9 (2500 ppm)
Total Solids	17.8 (2500 ppm)	4.0 (5300 ppm)
pH Range	6-9	4-6

¹ Assumes countercurrent rinse. Without a countercurrent rinse, this number could be as high as 2000 gals/ton peaches.

TABLE II

Composition of Peach Peel Solids

(lbs Total Slurry)	
(Ton Peaches)	153
% Total Solids	7-11
pH Range	9-11

4.

THE ECONOMICS

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Peach-Peel Slurry

The economics of using dry caustic peeling of peaches will vary widely from plant to plant because of different charges associated with waste treatment and solids disposal. Great economic differences also exist between the case where an existing conventional peeler is

being replaced with a dry caustic system and the case where a plant is choosing between the two systems for a completely new installation.

The numbers presented in this report are based upon two seasons of operation in parallel with a

conventional peeler at the Del Monte, San Jose, California plant. During these two operating periods, capacity and performance of the dry system has been continually improved. Additional operation may further enhance the economics.

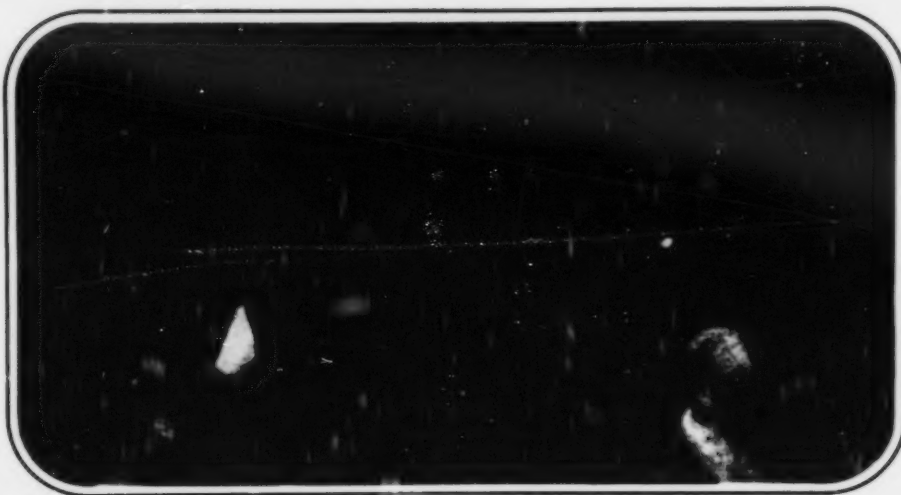
Not included in these economics is a reported 1-2% loss of canned peaches due apparently to over peeling in the dry system. This problem indicated in the first season was attacked by reducing the concentration of caustic spray and by adjusting the belt drive to give increased throughput (from 12 TPH to 20 TPH). At the end of the second season, however, there was still a reported loss.

The following numbers can be used for comparison with either existing conventional peeling costs or new installations. The canner must factor in his local surcharge and obtain a cost (or credit) for solids disposal at his locality for his specific comparison.

Estimated Costs for Dry Peeling System	
I. Labor (12 men @ \$1.50/hr)	\$180
II. Electric Power (14.5 kw @ 10¢/kwh)	145
III. Maintenance (5% of equipment cost)	100
IV. Lub. (included in overhead)	
V. General Plant Cost (6¢ @ 10% of operating cost)	100
VI. Materials	
Water (1800 gals @ 25¢/1000 gals)	45
Chemicals (5.2 lb NaOH @ \$1.00/lb)	52
Ion exchange	
TOTAL Materials	97
VII. Sewer Charges (Assumed rate)	
Base @ 75¢ of water billing	36
Surcharge BOD @ 1.5¢/lb @ 300 ppm	150
SS @ 2.5¢/lb @ 250 ppm	31
TOTAL Sewer Charges	196
TOTAL OPERATING COSTS	
Fixed Charges (Plant @ \$60,000 @ 10% interest)	6000
Depreciation @ 15% of fixed cost	9000
Interest @ 8%	4800
Taxes, Insurance @ 3% of equipment cost	1200
TOTAL Fixed Charges	21000
Total Operating Costs (Dry Peeling System)	23000
Conventional Peeling System	
Depreciation @ 15% of fixed cost	9000
Interest @ 8%	4800
Taxes, Insurance @ 3% of equipment cost	1200
TOTAL Fixed Charges	15000
Total Operating Costs (Conventional Peeling System)	15000

5.

AREAS OF APPLICATION



"Flanged" and "Stub" Discs

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Commercial-scale caustic peeling of clingstone peaches has demonstrated a potential 90 percent reduction in water use and a 60 percent reduction in pollutants generated for the peeling process. Such reductions will be reflected in lower waste treatment costs for the liquid effluent.

Further tests of the Del Monte design will be needed to substantiate project reductions in the use of caustic and effect on product yield.

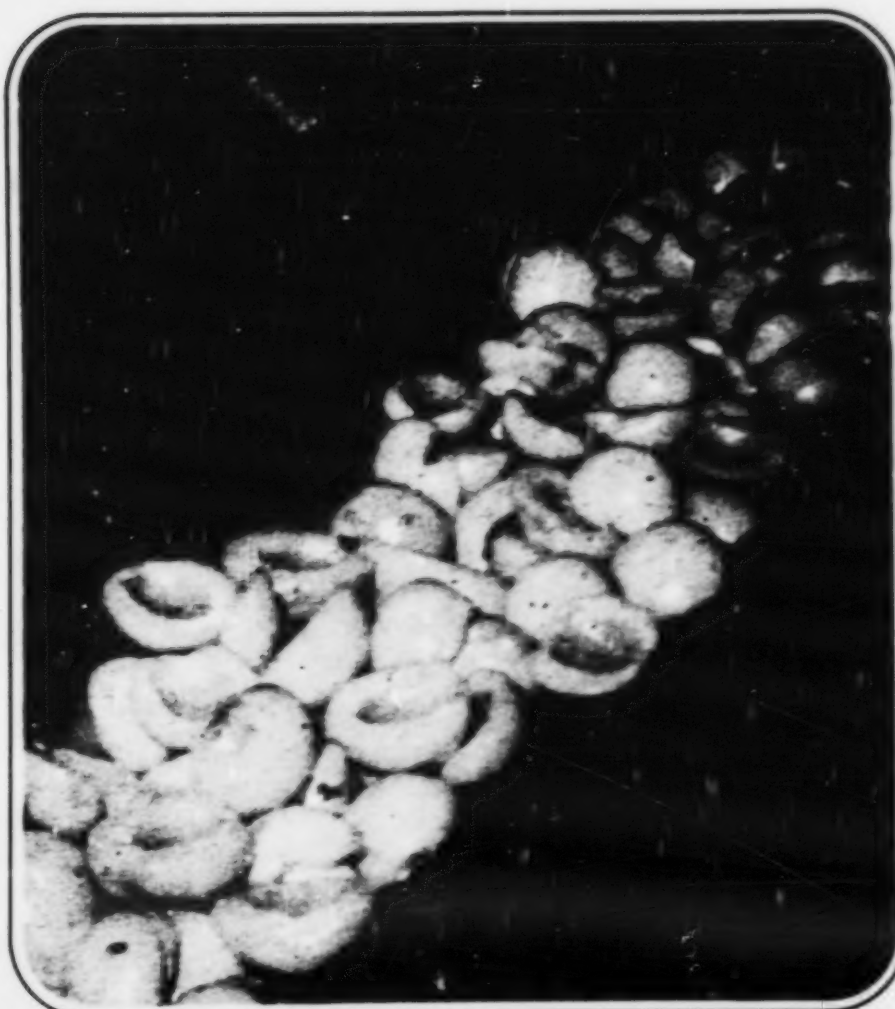
An earlier research project (EPA Research and Development Grant 12060 FQE) resulting in the soft rubber disc design indicated that the dry caustic system has potential to peel whole apricots, freestone peaches, and bartlett pears.

A commercial dry caustic peeler operated successfully on freestone peaches during the 1972 season at Delmar Foods in Watsonville, California.

The same equipment manufacturer has sold two additional peelers which will be operating in the 1973 season on freestone peaches.

There is additional economic incentive for use on freestone (as opposed to clingstone) peaches, since the mechanical action of the wiper effectively removes bruises and decreases the higher cost of hand inspection associated with freestone peaches.

Two additional equipment manufacturers have also sold dry peelers for freestone peaches which will be in operation in the 1973 season and are now offering dry caustic peelers for clingstone peaches.



Dry Peeled Peaches to Inspection Station

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**For further
information:**

**A detailed final
report on this project
is currently being
prepared. Information
relating to this
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